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(54) DYNAMIC IMAGE CODER, DYNAMIC IMAGE DECODER, DYNAMIC IMAGE CODING METHOD AND DYNAMIC IMAGE DECODING METHOD

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(57) Abstract:

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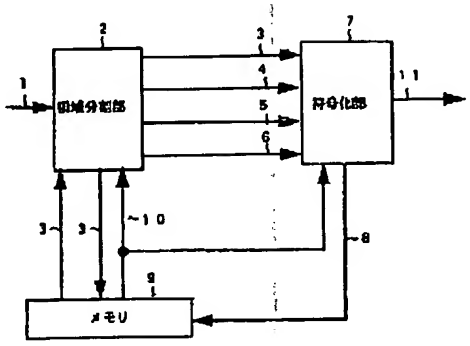
SOLUTION: An input image signal 1 is given to an area division section 2. An area shape of one preceding frame extracted from an external memory is used for an initial area shape and the input image signal 1 is divided into pluralities of areas. The area division section 2 applies re-division of the area, based on activity or the like in each area, and conducts integral processing so as to reduce the coding cost between one area and its vicinity area. Area shape information 3 or the like decided by the area division section 2 is coded at a coding section 7 and converted into a bit stream 11. The coding section 7 provides a locally decoded image 8 and writes it to an external memory 9. The locally decoded image 8 is used for a reference image 10 for area division processing and coding processing. The area shape information 3 is written in the external memory 9 and used for area division processing.



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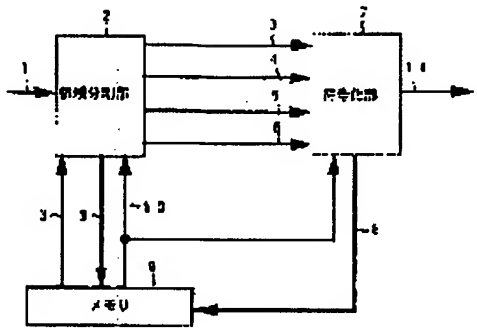

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the technique which encodes a dynamic image. It is related with predicting coding which encodes by predicting a motion of an object especially.
[0002]
[Description of the Prior Art] Drawing 23 is the block diagram showing the configuration of dynamic-image coding equipment based on the advice H.263 of ITU-T which is the first conventional technique. this drawing -- setting -- 1 -- an input image and 101 -- difference -- in an adder and 109, memory and 111 express the prediction section and, as for 112, a partial decode picture signal and 110 express [a vessel, the prediction error signal with which the coding section and 105 were decoded for a prediction error signal and 104 and the decode section and 107 were decoded / 102 / a prediction signal and 103 / for coded data and 106 and 108] a motion vector, respectively.
[0003] the input image 1 which should be encoded first -- difference -- it is inputted into a vessel 101. difference -- a vessel 101 takes the difference of this input image 1 and the prediction signal 102 mentioned later, and outputs it as a prediction error signal 103. The coding section 104 encodes the input image 1 or the prediction error signal 103, and outputs coded data 105. As the approach of coding in the coding section 104, the prediction error signal 103 is changed into a frequency domain from a space field using DCT (DiscreteCosine Transformation : discrete cosine transform) which is a kind of orthogonal transformation, and the technique of carrying out linear quantization of the transform coefficient obtained by DCT is adopted.
[0004] The coded data 105 obtained in said coding section 104 branches to two, one side is sent out towards the receiving-side decryption equipment which is not illustrated, and another side is inputted into the decode section 106 in this equipment. The decode section 106 performs actuation contrary to the coding section 104, and outputs it in quest of the decode prediction error signal 107 from coded data. An adder 108 searches for and outputs the decode picture signal 109 by adding the decode prediction error signal 107 to the prediction signal 102. The prediction section 111 performs motion compensation prediction using the decode picture signal 109 before [one] being stored in the input image 1 and memory 110 which should be encoded, and outputs the prediction signal 123 and a motion vector 112. At this time, a motion compensation is performed per block of the fixed size which consists of 16x16 pixels called a macro block. To the block located in the field where a motion is still more intense, there is a function to perform motion compensation prediction as an optional function per 8x8-pixel subblock which quadrisected the macro block. thus, the called-for motion vector 112 is sent out toward the receiving-side decryption equipment which is not illustrated -- having -- the prediction signal 102 -- said difference -- it is sent to a vessel 101 and an adder 108.
[0005] Drawing 24 is the block diagram of the dynamic-image coding equipment concerning the second conventional technique. This equipment is based on L.C.Real and others. A Very Low Bit Rate Video Coder Based on Vector Quantization (IEEE Trans.on Image Processing, VOL.5, NO.2, Feb.1996) It is based on the proposed coding method. this drawing -- setting -- 113 -- the field division section and 114

-- in the field decision section and 116, a motion vector and 118 express the coding section and, as for 119, coding mode information and 117 express [the prediction section and 115] coded data, respectively.

[0006] Like drawing 24 , the input image 1 is first divided into two or more fields in the field division section 113 by this method. In the field division section 113, the field configuration based on a motion compensation prediction error is determined. Out of ten kinds of block sizes 4x4 prepared beforehand, 4x8, 8x4, 8x8, 8x16, 16x8, 16x16, 16x32, 32x16, and 32x32 By the threshold judging of distribution of an inter-frame signal, a small block is assigned to the large field of a motion and the big block is assigned to the small field of motions, such as a background. About the prediction error signal acquired in the prediction section 114, the variance is calculated in the field decision section 115, and, specifically, the block size is determined based on this. It is determined at this time, and according to the coding mode information of the attribute information 116, a prediction error signal or the HARASHIN number is encoded in the coding section 118, and the attribute information 116, such as field configuration information and coding mode of each field, and a motion vector 117 also obtain coded data 119. Subsequent processings are the same as the first conventional technique.

[0007]

[Problem(s) to be Solved by the Invention] With the conventional technique of the above first, the form of the field of a coding unit is limited to two kinds. And both they are squares. Therefore, since it will encode fair especially even if it is a field like the background which does not have a motion so much and is fields, such as an edge part of the intense photographic subject of a motion, coding which was dynamically adapted for the scene structure of an image cannot be performed.

[0008] Moreover, there is room of the improvement to adaptability [as opposed to / although coding corresponding to the scene structure of an image by the conventional technique of the above second preparing the square block of two or more sizes, encoding coarsely at the block with a big field low / of significance /, and encoding densely at the block with a small field high / of significance / is performed, the configuration of a field is limited to the square block, and / the image field of the configuration of arbitration].

[0009] Moreover, when performing field division corresponding to an arbitration configuration and encoding in this field unit, the amount of operations concerning field division not only increases, but the amount of signs about a field configuration increases.

[0010] It is made in order that this invention may solve the above technical problems, and the purpose is in offering the dynamic-image coding technique using the field division technique which can respond to various image structures exactly. The more concrete purpose of this invention is to reduce the amount of signs concerning the amount of operations and field configuration about field division, coding mode, etc. while performing coding which was more adapted for the scene structure of an image by choosing the approach of field division, and the approach of coding appropriately according to the contents of an image or each field. Still more nearly another purpose of this invention is in offer of the technique which decodes correctly the coded data of the field divided into various configurations.

[0011]

[Means for Solving the Problem] The field division section which outputs the picture signal which this invention divided the input digital image into two or more fields, and was classified for every field, The memory which memorizes the information showing the field configuration acquired by this field division section, The coding section which encodes the picture signal of the field outputted from said field division section, motion information, attribute information, the information showing the field configuration of an input image, etc., and outputs coded data, The projection section which a preparation and said field division section read the field configuration of the image by which field division coding was carried out from said memory to the past, projects them on the image which should be encoded, and is made into an initial field configuration, The division processing section divided into a smaller field based on the predetermined judgment approach about each of the field of the input image which made initial form the field configuration acquired by this projection section, It is characterized by having the integrated processing section which unifies a field, judging whether it unifies with the field which

adjoins based on the predetermined judgment approach about each of two or more fields divided by this division processing section.
[0012] Moreover, it is characterized by this invention containing the activity calculation section from which said division processing section was obtained by said projection section and which calculates activity for every field, the comparator in comparison with the reference value beforehand set up in this activity, and the thin division section which divides the field where said activity exceeds a reference value to a still smaller field as a result of the comparison in this comparator.
[0013] Moreover, said division processing section is characterized by for the field configuration to contain the activity calculation section which computes activity per block of a fixed size independently, the comparator in comparison with the reference value beforehand set up in this activity, and the thin division section which divides the field of the block location where activity exceeds a reference value to a still smaller field as a result of the comparison in this comparator about each field where this invention was obtained by said projection section.
[0014] Moreover, the evaluation value calculation section in which this invention computes the evaluation value of the result to which said field division section carried out field division based on the predetermined evaluation approach, The evaluation value when performing field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded is judged, and it is characterized by having the judgment section which chooses whether the field configuration of the image by which field division coding was carried out is used for the past.
[0015] Moreover, this invention is characterized by said judgment section performing field division, without using for the past the field configuration of the image by which field division coding was carried out, when the evaluation value when performing field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded exceeds the reference value set up beforehand.
[0016] Moreover, this invention is characterized by said judgment section performing field division within a frame, when the evaluation value when performing field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded exceeds the reference value set up beforehand.
[0017] Moreover, this invention is the coded data of the image encoded after being divided into two or more fields. In the dynamic-image decryption equipment which inputs coded data including the division information on whether field division was performed in the past using the field configuration of the image by which field division coding was carried out, and decodes this coded data The field configuration restoration section which restores the configuration of each field which decoded field configuration information based on said division information, and was divided on the occasion of coding, The sequence that the field was encoded based on the configuration of each restored field is specified, and it is characterized by having the image data decode section which decodes the image of each field from coded data.
[0018] Moreover, the field division section which outputs the picture signal which this invention divided the input digital image into two or more fields, and was classified for every field, The coding section which encodes the picture signal of the field outputted from this field division section, motion information, attribute information, the information showing the field division condition of an input image, etc., and outputs coded data, It is characterized by having the coding mode selection section which changes the combination in the coding mode which can be chosen based on the size of the field obtained by a preparation and said field division section.
[0019] Moreover, this invention is set to the dynamic-image decryption equipment which inputs and decodes the coded data of the image encoded after being divided into two or more fields. The field configuration restoration section which restores the configuration of each field divided on the occasion of coding based on the field configuration information included in coded data, The combination in the coding mode which can be chosen based on the size of each restored field is specified. The coding mode of this field is specified from the symbolic language corresponding to the coding mode in coded data,

and it is characterized by having the image data decode section which decodes the image of each field based on this coding mode.
[0020] Moreover, the field division step which outputs the picture signal which this invention divided the input digital image into two or more fields, and was classified for every field, The memory step which memorizes the information showing the field configuration acquired by this field division section, The coding step which encodes the picture signal of the field outputted from said field division section, motion information, attribute information, the information showing the field configuration of an input image, etc., and outputs coded data, The projection step which a preparation and said field division step read the field configuration of the image by which field division coding was carried out from said memory to the past, projects them on the image which should be encoded, and is made into an initial field configuration, The division processing step divided into a smaller field based on the predetermined judgment approach about each of the field of the input image which made initial form the field configuration acquired by this projection section, It is characterized by having the integrated processing step which unifies a field, judging whether it unifies with the field which adjoins based on the predetermined judgment approach about each of two or more fields divided by this division processing section.
[0021] Moreover, this invention is characterized by said division processing step containing the activity calculation step which was obtained in said projection step and which calculates activity for every field, the comparison step in comparison with the reference value beforehand set up in this activity, and the fragmentation rate step which divides the field where said activity exceeds a reference value to a still smaller field as a result of the comparison in this comparison step.
[0022] Moreover, the activity calculation step to which this invention computes activity per block of a fixed size regardless of the field configuration about each field where said division processing step was obtained in said projection step, It is characterized by including the comparison step in comparison with the reference value beforehand set up in this activity, and the fragmentation rate step which divides the field of the block location where activity exceeds a reference value to a still smaller field as a result of the comparison in this comparison step.
[0023] Moreover, the evaluation value calculation step to which this invention computes the evaluation value of the result to which said field division step carried out field division based on the predetermined evaluation approach, The evaluation value when performing field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded is judged, and it is characterized by having the judgment step which chooses whether the field configuration of the image by which field division coding was carried out is used for the past.
[0024] Moreover, this invention is characterized by performing field division, without using for the past the field configuration of the image by which field division coding was carried out, when an evaluation value when said judgment step performs field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded exceeds the reference value set up beforehand.
[0025] Moreover, this invention is characterized by performing field division within a frame, when an evaluation value when said judgment step performs field division based on the field configuration of the image by which field division coding was carried out in the past in the image which should be encoded exceeds the reference value set up beforehand.
[0026] Moreover, this invention is the coded data of the image encoded after being divided into two or more fields. In the dynamic-image decryption approach which inputs coded data including the division information on whether field division was performed in the past using the field configuration of the image by which field division coding was carried out, and decodes this coded data The field configuration restoration step which restores the configuration of each field which decoded field configuration information based on said division information, and was divided on the occasion of coding, The sequence that the field was encoded based on the configuration of each restored field is specified, and it is characterized by having the image data decode step which decodes the image of each field from coded data.

[0027] Moreover, the field division step which outputs the picture signal which this invention divided the input digital image into two or more fields, and was classified for every field, The coding step which encodes the picture signal of the field outputted from this field division step, motion information, attribute information, the information showing the field division condition of an input image, etc., and outputs coded data, It is characterized by having the coding mode selection step which changes the combination in the coding mode which can be chosen based on the size of the field obtained in the preparation and said field division step.
[0028] Moreover, this invention is set to the dynamic-image decryption approach which inputs and decodes the coded data of the image encoded after being divided into two or more fields. The field configuration restoration step which restores the configuration of each field divided on the occasion of coding based on the field configuration information included in coded data, The combination in the coding mode which can be chosen based on the size of each restored field is specified. The coding mode of this field is specified from the symbolic language corresponding to the coding mode in coded data, and it is characterized by having the image data decode step which decodes the image of each field based on this coding mode.
[0029]
[Embodiment of the Invention]
The gestalt of gestalt 1. book implementation of operation explains the coding equipment of a publication, and the dynamic-image coding equipment by the approach to claims 1 and 10. Drawing 1 is the block diagram showing the configuration of the dynamic-image coding equipment in the gestalt of this operation. this drawing -- setting -- 1 -- an input image and 2 -- the field division section and 3 -- field configuration information and 4 -- a field picture signal and 5 -- field motion information and 6 -- in the coding section and 8, memory and 10 express a subtraction image and, as for 11, a partial decode image and 9 express [field attribute information and 7] a coding bit stream, respectively. Drawing 2 is a flow chart which shows actuation of this coding equipment.
[0030] First, actuation of the whole equipment is explained based on drawing 1 and drawing 2 . The input image 1 is inputted into the field division section 2 (S1), first, before [one] being stored in memory 9, reads the field configuration information 3 on the image (reference image) by which field division coding was carried out, and performs two processings, initial division (S2) and the near field integration (S3), by making this field configuration into initial form here. Actuation of the field division section 2 is described in detail later. The field division section 2 delivers the attribute information 6, such as the configuration information 3 and the picture signal 4 of each field showing the condition of having divided the input image into the field as a result, the motion information 5 on each field, and coding mode of each field, to the coding section 7. Moreover, in order to consider as the initial division condition of a frame of next performing field division and coding, the field configuration information 3 is stored in memory 9. In the coding section 7, based on a suitable coding method, such information is changed into a bit pattern, is multiplexed, and it outputs as a coding bit stream 11 (S4, S5). Moreover, in order to perform the field division and coding based on motion compensation prediction, in the coding section 7, the partial decode image 8 is generated for every field, and this is stored in memory 9. The field division section 2 and the coding section 7 read the partial decode image stored in memory 9 as a subtraction image 10, and perform motion compensation prediction. However, since motion compensation prediction is performed in process of field division, it is not necessary to newly perform motion compensation prediction in the coding section 7.
[0031] Hereafter, actuation of the field division section 2 which is the main element of this invention is explained in full detail. Drawing 3 is the detailed block diagram of the field division section 2 in the gestalt of this operation. In this drawing, in the projection section and 13, the division processing section and 15 express division configuration information, and, as for 16, initial form information and 14 express [12] the integrated processing section, respectively.
[0032] The internal configuration of the division processing section 14 is shown in drawing 4 . In this drawing, the activity calculation section and 18 express activity and, as for 19, 17 expresses the division judging section, respectively. Drawing 5 is a flow chart which shows actuation of the projection section

12 and the division processing section 14.
[0033] The division processing section 14 in the gestalt of this operation performs division based on activity according to claim 2. Activity is data evaluated about the predetermined property of image information, in order to judge the description or property of an image.
[0034] If the image by which field division coding was carried out Ft and one frame ago in the image encoded first is set to Ft-1, in the projection section 12, the field configuration information 3 on Ft-1 is read from memory 9, the field configuration of Ft-1 will be projected on Ft (S8), and the division processing section 14 will be passed by making the projected field configuration into the initial form information 13. Suppose that the last field configuration (referred to as Sfinaln) of Ft-1 was projected on Ft like drawing 6 . The number of fields contained in Ft at this time is set to N0, and S0n [each field] (1 <=n<=N0) is written. each S [this] -- (S9) which judges whether it divides further about 0 n. For this reason, the activity of each field is computed in the activity calculation section 17. Activity here adopts the amount of signs-distortion cost L (S0n) shown in a degree type.
[0035]
[Equation 1] L(S0n) = D(S0n)+ lambdaR (S0n) -- D (S0n) is R (S0n)S0n inS0n coding distortion and the amount of signs, and lambda is a constant here.
[0036] The internal configuration Fig. of the activity calculation section 17 is shown in drawing 7 . In this drawing, in the decode section and 22, the coding distortion calculation section and 23 express the amount of signs-distortion cost calculation section, and 24 expresses [20 / the provisional coding section and 21] a constant, respectively.
[0037] Moreover, drawing 8 is a flow chart which shows actuation of the activity calculation section.
[0038] In the provisional coding section 20, coding of S0n is performed first (S13). The purpose of coding here is to calculate [the partial decode image for coding distortion D (S0n) calculation, and] the amount R of signs (S0n). With the gestalt of this operation, it encodes in the provisional coding section 20 by performing motion compensation prediction using the subtraction image 10 in memory 9. Total of these amounts of signs is R (S0n) including attribute information, such as motion information for the data encoded here to specify image data, i.e., a prediction error signal, or the HARASHIN number, and a prediction image and coding mode. A prediction error signal is acquired as a difference of the prediction image which moves with the HARASHIN number and is obtained as a result of parameter retrieval.
[0039] On the other hand, in the decode section 21, a partial decode image is generated using the coded data obtained in the provisional coding section 20 (S14). Subsequently, in the coding distortion calculation section 22, distortion D between this partial decode image and a subject-copy image (S0n) is calculated (S15). The amount of signs-distortion cost calculation section 23 calculates the above-mentioned amount of signs-distortion cost L (S0n) under a constant 24 based on coding distortion D (S0n) obtained in the amount R of signs (S0n) obtained in the provisional coding section 20, and the coding distortion calculation section 22 (S16). The division judging section 19 is passed by making computed L (S0n) into activity 18.
[0040] Subsequently, in the division judging section 19, it judges whether S0n is divided further as compared with activity 18 and the threshold TH set up beforehand (S9). This division judging section 19 is equivalent to the comparator of this invention. When activity 18 is larger than TH, the S0n is divided. That is, the division judging section 19 is equivalent also to the group division section of this invention. About the approach of division, there is the approach of carrying out equal segmentation to the minimum block which constitutes the field, for example like drawing 9 etc. Size of the block divided as the other example according to the size of a field can also be made adjustable.
[0041] It writes division field S1n [each field in this time]. The integrated processing section 16 is passed by making this division condition into division configuration information.
[0042] subsequently, the integrated processing section 16 -- setting -- each S -- integration with the field which adjoins about 1 n is performed.
[0043] The information 3 and the picture signal 4 of each field with which the field division condition of the input image 1 is finally expressed, the motion information 5, and the attribute information 6 are outputted to the coding section 7 after division of a field, and integrated processing termination.

[0044] The configuration information on a field is included in the information 3 showing a field division condition. As configuration information on a field, the information about the processing process of division and integration is adopted, for example. At a decode side, a field configuration can be grasped by reproducing the same processing as coding equipment based on this information. When the field configuration of the image by which field division coding was carried out one frame ago is made into initial form, about the field which does not perform re-division, it is not necessary to transmit the information about a division process that what is necessary is to encode the positional information of this field, and the information about the processing process of division, and to transmit only about the field where re-division was performed. Field configuration information is not only effectively reducible, but on a scene like TV meeting, it can reduce the field division processing time.

[0045] Compared with the case where actuation of the field division section 2 containing the above projection section 12 performs field division by making into initial form the condition of having divided the image equally unconditionally, without using the field configuration of one frame ago, the computational complexity in field division and the amount of signs of a field configuration are reducible.

[0046] Although amount of signs-distortion cost was adopted as activity with the gestalt of this operation, the following can be considered as the other example.

[0047] The first example is the prediction error power accompanying motion compensation prediction of a field. Motion compensation prediction is performed with a block matching method. At this time, in order to apply the usual block matching method for an arbitration configuration, as shown in drawing 10 , the configuration of a field defines the rectangle circumscribed to a field, and performs block matching in this circumscription rectangle. Drawing 11 shows the approach of the motion compensation prediction by the block matching method. In a block matching method, the vector v which gives the following formula is searched for as a motion vector of the predicted field S.

[0048]

[Equation 2]

$$D_{\min} = \min_{v \in R} \left(\sum_{S} [f_S(x + v_x, y + v_y, t-1) - f_S(x, y, t)]) \right)$$

A pixel value when it can set at the time of day t of the predicted field S (x y) However, fS (x, y, t), The pixel value of a location to which only the vector v carried out the variation rate of fS (x, y, t-1) and the location (x, y, t-1) for the pixel value when it can set at time of day t-1 (x y) is set to fS (x+vx, y+vy, t-1). Moreover, R expresses the motion vector retrieval range.

[0049] By the vector acquired as a result, a prediction image is given by fS (x+vx, y+vy, t-1), and prediction error power, i.e., activity, serves as Dmin. As a result of performing motion compensation prediction in the field configuration of the image by which field division coding was carried out one frame ago by this approach defining activity, a prediction error can perform re-division about a large field, and can change a field configuration.

[0050] The second example is a variance in a field. The variance expresses the complexity of pixel distribution of a field and a variance becomes large in the field in which pixel values, such as an edge, contain the image which changes rapidly. If the pixel value in Field S is set to fS (x, y, t) and the average of the pixel value in Field S is set to muS, variance sigmaS in a field will be given by the degree type.

[0051]

[Equation 3]

$$\sigma_s = \frac{1}{N} \sum_{S} (f_S(x, y, t) - \mu_S)^2$$

When adopting this activity and the field configuration of the image by which field division coding was carried out one frame ago is used, about a field which contains an edge, re-division can be performed and a field configuration can be changed.

[0052] The third example is the edge reinforcement in a field. It can ask for edge reinforcement with the Sobel operator (Sobel Operator) indicated by "Edge detection by compass gradient masks" (Journal of Computer Graphics and Image Processing, Vol.6, No.5, Oct.1977) for example, by G.Robinson, or can ask for it as the number of pixels (edge part surface-of-cloth product) distributed on an edge. If this activity is adopted, when the field configuration of the image by which field division coding was carried out one frame ago is used, about the field containing an edge, an edge can be detected, a field can be re-divided based on that result, and a field configuration can be changed.
[0053] The fourth example is the linear combination of the value of the activity described until now. By carrying out moderate weighting to each activity value, the corresponded thing to various images is made.
[0054] The gestalt of gestalt 2. book implementation of operation explains the coding equipment of a publication, and the dynamic-image coding equipment based on an approach to claims 3 and 12. With the gestalt of this operation, since only the configurations of the division processing section 14 of the dynamic-image coding equipment stated with the gestalt 1 of operation differ, only this part is explained. The internal configuration Fig. of the division processing section 14 in the gestalt of this operation is shown in drawing 12 . In this drawing, 25 is the block extract section. Moreover, drawing 13 is a flow chart which shows the actuation of the division processing section 14 shown in drawing 12 .

[0055] In the division processing section 14 of the gestalt of this operation, regardless of the projected field configuration, it is the block extract section 25 first, and the block (B0m) of a fixed size is extracted (S17), and activity is computed in this block unit. Next, in the division judging section 19, as compared with activity 18 and the threshold TH set up beforehand (S18), when activity 18 is larger than TH, it divides only about the field of the block location (S19). About the approach of division, there is the approach of carrying out equal segmentation of the block etc., for example like drawing 14 .
[0056] With the gestalt of this operation, since activity is computed regardless of a field configuration, when a part of big field has modification, only the part can be detected and divided.
[0057] The gestalt of gestalt 3. book implementation of operation explains the coding equipment of a publication, and the dynamic-image coding equipment based on an approach to claims 4 and 13. With the gestalt of this operation, since only the configurations of the field division section 2 of the dynamic-image coding equipment stated with the gestalt 1 of operation differ, only this part is explained. The internal configuration Fig. of the field division section 2 in the gestalt of this operation is shown in drawing 15 . In this drawing, in the evaluation value calculation section and 27, the initial-state judging section and 28 express an evaluation value, and 29 expresses [26] an initial-state decision flag, respectively.
[0058] Drawing 16 is a flow chart which shows actuation of the field division section 2 by the configuration of drawing 15 .
[0059] In the field division section 2 of the gestalt of this operation, the evaluation value (it may be E0t) of Ft when performing division based on this field configuration is computed to Ft which projected the field configuration of Ft-1 in the projection section 12 (S22). As an evaluation value, the total L of amount of signs-distortion cost [of each field Sk (1 <=k<=N0) stated with the gestalt 1 of operation] L (Sk) is adopted.
[0060]
[Equation 4]

$$L = \sum_{k=1}^{N_0} L(S_k)$$

In the initial-state judging section 27, it judges whether the field configuration of Ft-1 is made into an initial state based on this evaluation value. An actual judgment is performed by carrying out the threshold judging (S23) of this evaluation value. this -- when evaluation value E0t exceeds the threshold TH0 set up beforehand, the field configuration of Ft-1 is not used but the condition of having divided the

whole frame into the block of a fixed size equally is made into an initial state (S24) -- etc. -- it divides regardless of the condition of one frame ago. The coding section 7 is passed by making information on whether the field configuration of Ft-1 is used into the initial-state decision flag 29 as a result of a threshold judging.
[0061] As the other example, when E0t exceeds a threshold TH0, only the information in a frame can be used and field division and coding can also be performed. There is field division which makes the variance for example, in a field activity as the approach of field division only using the information in a frame. It is as the gestalt 1 of operation having described the variance in a field.
[0062] If a variance is adopted as information in a frame, a field can be divided according to the complexity of the local structure of an image.
[0063] Moreover, two thresholds can be set up, and the field division only using the information in a frame and the field division using the inside of a frame / inter-frame information can also be changed and used together.
[0064] The threshold set up beforehand is set to TH1 and TH2 (TH1 > TH2). When E0t exceeds a threshold TH1, as mentioned above, field division is performed only using the information in a frame. Moreover, at the time of TH2 < E0t<= TH1, field division is performed based on the amount of signs-distortion cost, prediction error power, etc. which asked by performing motion compensation prediction.

[0065] According to the gestalt of this operation, an inter-frame motion is large, and when there is no semantics in using the configuration of field division one frame ago, field division can be performed, without using the field configuration of one frame ago.
[0066] Furthermore, by judging a scene change etc. based on an evaluation value, when there is a scene change etc., coding according to the contents of the image can be performed more, such as changing to the field division which used only the information in a frame.
[0067] The gestalt of gestalt 4. book implementation of operation explains the dynamic-image decryption equipment which decodes the coding bit stream generated by the dynamic-image coding equipment which performs field division using the field configuration before [one] stating until now. The configuration of the decryption equipment concerning the gestalt of this operation to drawing 17 is shown.
[0068] this drawing -- setting -- 30 -- the bit stream analysis section and 31 -- the initial division approach decode section and 32 -- the initial division approach flag and 33 -- the projection section and 34 -- the field configuration decode section and 35 -- the attribute information decode section and 36 -- the image data decode section and 37 -- the motion information decode section and 38 -- in a prediction image and 41, the image restoration section and 42 express external memory, and 43 expresses [a motion parameter and 39 / the motion compensation section and 40] a playback image, respectively.
[0069] The decryption equipment in the gestalt of this operation is related with the partial image in an image frame or an image frame. The field configuration of the image by which field division coding was carried out one frame ago, or a partial image is used. When performing field division or not using the field configuration of the image of one frame ago The information about the approach of field division whether to encode only using the information in a frame is decoded first, and the coding bit stream showing the field configuration which expresses a field division condition based on this information below is decoded. The coding bit stream which consists of the image data of each field encoded by the predetermined coding approach next, attribute information on each field, and motion information on each field is decoded, a field image is restored, and the partial image field in an image frame or an image frame is reproduced.
[0070] With the gestalt of this operation, description of a field configuration is based on designation of the processing process when dividing and unifying a field in the case of coding. Description of the processing process of division is scanned in the sequence that the field was able to be decided beforehand, and is performed by describing whether division was performed or not. It is the same also about integration. What is necessary is to describe the positional information of the field, and the processing process of division only about the field where division was performed, in dividing using the

field configuration of one frame ago. With decryption equipment, like coding equipment, when using the field configuration of one frame ago, it can project on the image which should encode the field configuration of one frame ago, and a final field division condition can be restored based on the information about the processing process of division and integration.
[0071] Drawing 18 is a flow chart which shows actuation of the decryption equipment concerning the gestalt of this operation.
[0072] The coding bit stream 11 is first inputted into the bit stream analysis section 30, and conversion to coded data from a bit string is performed (S25). In decoding the initial division approach flag in the initial division approach decode section 31 among coded data first (S26), judging whether the field configuration of one frame ago is used from the initial division approach flag (S27) and using the field configuration of one frame ago, in the projection section 33, it projects the field configuration of one frame ago (S28). Moreover, in not using the field configuration of one frame ago, it carries out equal segmentation to the block of a fixed size like coding equipment (S29). Next, field configuration information is decoded in the field configuration decode section 34, and the field division condition of the partial image in an image frame or an image frame is restored by the above-mentioned approach (S30). By having restored the field, the coding sequence of the field information encoded in subsequent bit streams is specified. Each field is called Sn.
[0073] Subsequently, according to coding sequence, the data of each field are decoded one by one from a bit stream. The attribute information on Field Sn is first decoded in the attribute information decode section 35, and the coding mode information on a field etc. is decoded (S31). If it is INTAMODO, i.e., the mode which encodes a prediction error signal, here (S32), it will move in the motion information decode section 37, and a parameter will be decoded (S33). The motion parameter 38 is sent to the motion compensation section 39, and the motion compensation section 39 calculates the memory address equivalent to the prediction image in the reference image accumulated into external memory 42 based on this, and it takes out a prediction image from external memory 42 (S34). Subsequently, the image data of Field Sn is decoded in the image data decode section 36 (S35). In INTAMODO, the playback image 43 of the final field Sn is restored by adding this image data and prediction image 40 that were decoded. intra -- in the case of the mode, the decoded image data itself serves as the playback image 43 of the final field Sn. In order to use a playback image as a reference image for subsequent prediction image generation, it is written in external memory 42. Restoration of these decision and a playback image is performed in the image restoration section 41 (S36).
[0074] A series of processings are ended when carried out about all the fields included in the partial image in an image frame or an image frame. What is necessary is just to perform processing with the same said of the partial image in other subsequent image frames or an image frame.
[0075] Gestalt 5. drawing 19 of operation is the block diagram showing the configuration of the dynamic-image coding equipment concerning the gestalt of this operation.
[0076] In this drawing, the coding mode combination as which the coding mode selection section and 45 were chosen as for 44, and area size and 47 were chosen for a coding mode combination table and 46 is expressed, respectively.
[0077] Moreover, drawing 20 is a flow chart which shows actuation of the dynamic-image coding equipment by the configuration of drawing 19 .
[0078] With the gestalt of this operation, in case the coding mode of each field is chosen, the combination in the coding mode which can be chosen is beforehand decided to area size. as coding mode -- INTAMODO (interframe coding mode) and intra -- the case of not being different from the case where the mode (coding mode in a frame), the copy mode which copies the field image of the same location of one frame ago as it is, and a quantization parameter change 1 field front etc. is raised. for example, the field of big size -- intra -- since it is rare to choose the mode (coding mode in a frame), the coding mode which can be chosen is limited only to INTAMODO (interframe coding mode) and copy mode.
[0079] In the coding mode selection section 44, according to the size 46 of the field obtained by the field division section 2, the combination 47 in the coding mode which can be chosen from the combination

tables 45 in the coding mode set up beforehand is chosen (S40), and coding mode is determined from the inside (S41).
[0080] Since the coding mode which can be chosen without additional information according to area size can be effectively limited by the above configuration, the amount of signs in coding mode is reducible.
[0081] The gestalt of gestalt 6. book implementation of operation explains the dynamic-image decryption equipment which decodes the coding bit stream generated by the dynamic-image coding equipment stated with the gestalt 5 of above-mentioned operation, and obtains a playback image.
[0082] The configuration of the decryption equipment in the gestalt of this operation to drawing 21 is shown. In this drawing, the combination in the coding mode in which the area-size calculation section can choose 48 and the coding mode selection section and 50 can choose 49, and 51 express the coding mode decode section, respectively.
[0083] This decryption equipment restores the field configuration information that the field division condition in a coding bit stream is expressed first, about the partial image in an image frame or an image frame, from the area size of each field, specifies the combination in the coding mode of each field, and decodes coding mode. The coding bit stream which consists of image data of each field encoded based on this coding mode and motion information on each field is decoded, a field image is restored, and the partial image in an image frame or an image frame is reproduced.
[0084] Drawing 22 is a flow chart which shows actuation of the decryption equipment in the gestalt of this operation.
[0085] The coding pit stream 11 is first inputted into the bit stream analysis section 30, and conversion to coded data from a bit string is performed (S25). Field configuration information is decoded in the field configuration decode section 34 among coded data, and the condition of the field division in the partial image in an image frame or an image frame is restored (S26). The coding sequence of the field information encoded in subsequent bit streams is specified by restoration of this field division condition. In the text, each field is called Sn. Subsequently, according to coding sequence, the data of each field are decoded one by one from a bit stream. In the area-size calculation section 48, the area size of Sn is first computed from the configuration of each field Sn (S44). As an area size, as shown in drawing 10 , the size of the circumscription rectangle of a field, the number of pixels contained to a field are adopted. Next, in the coding mode selection section 49, the combination in the coding mode used in order to encode the field from the area size of Sn is chosen (S45). In the coding mode decode section 51, the coding mode information on Field Sn is decoded out of the selected combination (S46). Based on this coding mode, the image data of each field is restored below. About the restoration approach, it is the same as that of the approach stated with the gestalt 4 of operation.
[0086]
[Effect of the Invention] In the dynamic-image coding equipment of this invention, the field division section contains the division processing section and the integrated processing section including the field division section and the coding section. Consequently, since not only division of a field but integration is performed, flexible coding is realized in the structure of an image. Moreover, in the projection section, since it projects on the image which should encode the field configuration of the image by which field division coding was carried out one frame ago and considers as an initial field configuration, in the division processing section, re-division can be performed only about a field with modification of a configuration, and the amount of signs for the amount of operations concerning field division and a field configuration can be reduced.
[0087] Moreover, when the division processing section contains a comparator, the field which had modification of a configuration by comparing with the threshold which was able to determine the activity of a field beforehand is detected, re-division is performed only about the field, and since the other field does not divide, it can reduce the amount of signs for the amount of operations concerning field division, and a field configuration.
[0088] Moreover, the division processing section asks for activity per block of a fixed size regardless of a field configuration, and a new field can be detected, since only a part with modification of a

configuration can be detected and divided in a certain field when dividing only the field of the location of the block with which activity exceeds the threshold decided beforehand, for example, when another body appears in a big field like a background.
[0089] Moreover, the dynamic-image coding equipment of this invention can choose the technique of field division of the present frame in the direction which makes coding good based on the result when encoding as a field of the image which should encode the field configuration of one frame ago, when the judgment section contains the evaluation value calculation section including the judgment section.
[0090] Moreover, an inter-frame motion is large then, and when there is no semantics in using the field configuration of one frame ago, field division can be carried out, without using the field configuration of one frame ago.
[0091] Moreover, when a scene change etc. is detected based on an evaluation value, it can also change to the field division and coding which used only the information in a frame.
[0092] On the other hand, since the dynamic-image decryption equipment of this invention is equipped with the field division approach decode section, the field configuration restoration section, and the image data decode section, even if the field of various configurations is generated by the field division approach according to the contents of the image with dynamic-image coding equipment, it can respond. Therefore, combination with the dynamic-image coding equipment of this invention becomes easy.
[0093] Another dynamic-image coding equipment of this invention can reduce the amount of signs required for coding mode by limiting the combination in the coding mode which can be chosen with the size of the field obtained by the field division section including the field division section, the coding mode selection section, and the coding section.
[0094] On the other hand, since another dynamic-image decryption equipment of this invention is equipped with the field configuration restoration section, the coding mode selection section, and the coding section, even if the combination in the coding mode which can be chosen with the size of each field is limited with dynamic-image coding equipment, it can respond. Therefore, combination with the dynamic-image coding equipment of this invention becomes easy.
[0095] In the dynamic-image coding approach of this invention, a field division step contains a division processing step and an integrated processing step including a field division step and a coding step. Consequently, since not only division of a field but integration is performed, flexible coding is realized in the structure of an image. Moreover, in a projection step, since it projects on the image which should encode the field configuration of the image by which field division coding was carried out one frame ago and considers as an initial field configuration, in a division processing step, re-division can be performed only about a field with modification of a configuration, and the amount of signs for the amount of operations concerning field division and a field configuration can be reduced.
[0096] Moreover, when a division processing step contains a comparison step, the field which had modification of a configuration by comparing with the threshold which was able to determine the activity of a field beforehand is detected, re-division is performed only about the field, and since the other field does not divide, it can reduce the amount of signs for the amount of operations concerning field division, and a field configuration.
[0097] Moreover, a division processing step asks for activity per block of a fixed size regardless of a field configuration, only a part for the step which had modification of a configuration in a certain field when only the field of the location exceeding the threshold activity was beforehand decided to be of a block was divided is detected, and a new field can be detected, since it can divide, for example, when another body appears in a big field like a background.
[0098] Moreover, the dynamic-image coding approach of this invention can choose the technique of field division of the present frame in the direction which makes coding good based on the result when encoding as a field of the image which should encode the field configuration of one frame ago, when a judgment step contains an evaluation value calculation step including a judgment step.
[0099] Moreover, an inter-frame motion is large then, and when there is no semantics in using the field configuration of one frame ago, field division can be carried out, without using the field configuration of one frame ago.

[0100] Moreover, when a scene change etc. is detected based on an evaluation value, it can also change to the field division and coding which used only the information in a frame.
[0101] On the other hand, since the dynamic-image decryption approach of this invention is equipped with the field division approach decode step, a field configuration restoration step, and an image data decode step, even if the field of various configurations is generated by the field division approach according to the contents of the image by the dynamic-image coding approach, it can respond. Therefore, combination with the dynamic-image coding approach of this invention becomes easy.
[0102] The another dynamic-image coding approach of this invention can reduce the amount of signs required for coding mode by limiting the combination in the coding mode which can be chosen with the size of the field obtained by the field division step including a field division step, a coding mode selection step, and a coding step.
[0103] On the other hand, since the another dynamic-image decryption approach of this invention is equipped with a field configuration restoration step, a coding mode selection step, and a coding step, even if the combination in the coding mode which can be chosen with the size of each field is limited by the dynamic-image coding approach, it can respond. Therefore, combination with the dynamic-image coding approach of this invention becomes easy.

[Translation done.]